

Chapter 6

Selection, Implementation, Support and Maintenance

Learning Objectives

At the conclusion of this chapter, the reader will be able to:

- Conduct solution selection activities (e.g., identify organizational stakeholders, demonstrations, site visits, reference checks)
- Employ effective technical change management practices
- Identify and execute effective training and support methods (e.g., computer-based learning, classroom training, train the trainer, at-the-elbow support from superusers)
- Implement solutions while managing scope, schedule, budget and quality
- Maintain healthcare information systems (e.g., operate, upgrade)
- Analyze data for problems and trends (e.g., error reports, help desk logs, surveys, performance metrics, network monitoring)

Introduction

The systems selection process begins with the identification of a need and subsequent approval of a project proposal. The successful implementation and adoption of a new application or a system is dependent on an organized system selection process, followed by a well-planned and executed implementation strategy. Once a need has been identified within an organization, an effective governance committee evaluates it against the organizational mission, goals, objectives, information technology (IT) strategic plan, budget and available resources.

Once the decision is made to move forward, objectives, goals and measures of success should be clearly defined. Once the high-level strategy is defined, the team is assembled to analyze and further define the requirements. It is important to have the appropriate team members to ensure the analysis includes all parts of the organization affected by the new solution. Through this analysis, opportunities for process improvement and workflow efficiencies are identified.

Chapter 4 discussed in detail the items that should be included in a request for information (RFI) or request for proposal (RFP). To summarize,

A RFI

- Is an informal request for information that does not require commitment from either party
- Is a collection of documents designed to collect information regarding prospective vendors and their ability to meet the defined need or high-level requirements
- May or may not include budget or cost information

A RFP

- Is a formal request that leads to a contract between the organization and the selected vendor(s)
- Is a collection of documents that outline the detailed requirements and how each responding vendor will be compared for a final decision
- Always includes timelines and budget or cost information

Evaluating the vendors that respond to the RFP includes on-site visits, reference checks, demonstrations and sometimes a trial version or trial period for the system. After the list of possible vendors is narrowed down to a few, contract negotiations allow the organization to get the best possible deal based on price, payment plan, support levels and ongoing support. It is important to include a step to verify any regulations as part of any standard selection practice.

After the application and vendor have been selected, it is time to begin implementation. Understanding the different implementation strategies will help the organization choose the one that best fits its culture, objectives and available resources. Proper planning and a defined methodology will help decrease project risk and lead to a successful activation. For a smooth transition to support, the implementation project should include planning for post-live activities, such as configuration management, user communication, user support and new employee training, along with operations and maintenance, to ensure continuous performance of the system.

Solution Selection Criteria

As mentioned earlier during the analysis phase, system selection begins with a defined need based on the organization's strategic objectives or a solution to a problem that blocks achievement of an organizational or departmental objective. The selection and implementation processes are built around fulfilling the need and realizing the solution that will meet the organization's expected outcomes. There is quite a bit of overlap with the information identified/defined in the systems analysis phase and the solution selection process as much of the analysis information helps inform this process. The process defined below should be used as a template and modified as needed to fit the specific situation and satisfy the current regulatory requirements.

As was described in [Chapter 4](#), the need and justification for a project are often described in a formal business case, project proposal, or a needs assessment. This document outlines the goal and objectives of the request, along with the high-level resources required to meet them. Most organizations request a business case prior to approving the proposed system selection process. If the organization does not require a business case, it is imperative that the IT governance committee request one. The challenge comes from defining the required resources this early in the process. Most often, they are defined through scientific guesses. If time allows, market research can provide more accurate estimates. Market research starts with high-level requirements, not the detailed ones identified later in the process, and may be conducted formally or informally. Formal market research is completed through a process similar to the RFI process. With market research, however, it is clearly stated that the RFI is for research only, with no intent to purchase at this time. The informal process is completed through vendor exhibitions, Internet searches and contact with other similar organizations.

The business case or project proposal should present the need and requirements, not necessarily the solution, but again, it informs the solution selection process. This document should avoid the identification of a single solution, but rather several solutions or recommendations. The governance committee reviews the business case and decides whether to move forward based on the system's fit within the organization's strategic plan or operational goals and the availability of resources to complete.

Once approval to move forward is received, the selection criteria are built on the defined need and high-level requirements that the business case identified as necessary for the solution. Whether the need is to improve office-scheduling processes through automation or to create a paperless environment in an acute care setting, the requirements go beyond end-user functionality to include nonfunctional necessities also.

A list of requirements could include the following:

Functional requirements

- Application with organization-specific functionality
- Security and privacy requirements
- Regulatory requirements
- Reporting capability, including standard and custom reporting
- Integration with other applications or devices
- Interoperability requirements
- Access from multiple locations (acute care, long-term care, clinics, etc.)
- Access from mobile devices
- Redesigned workflow

Decision support functionality/nonfunctional requirements

- Cloud infrastructure
 - Capacity requirements
 - Separate cloud environments for production, development, testing and training
 - Load balancing configuration and requirements
 - Software as a service or platform as a service requirements
- Facility IT infrastructure
 - Space, cooling and power
 - Hardware for production, development, testing and training environments
- Hardware for disaster recovery or high availability
- Hardware for reporting
- Backup and recovery plans and procedures
- Workstation and printer requirements and hardware
- Wired and wireless networks
- System installation, configuration and maintenance documentation
- Supplemental staffing for implementation, training and post live support
- Independent verification and validation to reduce risk by providing impartial reviews of business and technical aspects of the project
- Processes for issue resolution and requests for enhancement
- Maintenance and support process and procedures
- Expected procurement and implementation timeline, along with any constraints that would affect the timeline
- Expected availability, reliability and scalability
- Training requirements

The gap analysis might be the first step in defining these requirements. What is the status of your current application(s)? Are you planning to replace or enhance those systems? What manual processes can and must be improved

through automation? Throughout this process, it is important to focus the analysis on the identified need. Requirement creep can occur very quickly if the team is not focused. The governance committee and executive sponsors are there to help with ensuring the requirements fit within the defined goals and objectives.

Once the requirements are defined, they should be ranked to show which are required, preferred, or optional. It is rare for vendors to be able to meet every requirement, so clarity about which ones are absolutely necessary helps during the evaluation of responses. The rankings should be agreed upon by all committee members and used consistently for all vendors. The requirements and rankings feed into the RFI or RFP documentation as defined earlier in this chapter.

Through this process, a decision to build versus buy should be made. There are many factors that influence this decision. Does the organization have the skill set to build and support the new solution? Is there room in the budget to buy? What is the expected timeline? Which option fits with the organizational IT strategy? Is there a vendor who can meet the need and defined requirements? Based on these factors, the decision to build or buy may occur early in the process, after reviewing the RFI/RFP responses, or anytime in between.

One more analysis to perform is whether a cloud-based technology is preferred over an on premise solution. The analysis should include several criteria such as personnel requirements to install and maintain the software, hardware purchase and maintenance, proper monitoring and auditing and evaluating how well the system aligns with privacy and security requirements in the cloud.

Having the appropriate people involved in the selection process is key to being successful. The governance committee and executive sponsors have already been introduced. A facilitator should be identified early on to ensure that the activity progresses as expected, the defined process is followed and the right people are involved in the review team.

Selecting Review Team Members

The selection of the review team should be completed as early as possible. It is possible that the entire team might not be needed at the very early stages of the process or that some members may not be as actively involved as others. Team members should be identified early so they will be ready to participate when needed. Decisions about team membership should balance the importance of including the right people with the need to keep the size manageable.

The exact members will depend on what is being selected and should include representatives from clinical, organizational operations, IT and the business

department to ensure all affected areas are involved. Below is a list of who might be involved in the selection team:

- **Facilitator**—Provides overall leadership and coordination of the system selection process.
- **Executive sponsor**—Provides support, clarifies the mission, facilitates necessary resources and acts as champions within the organization.
- **Technical representative**—Provides technical expertise, such as IT, biomedical and telecommunications.
- **Business representative**—Provides business or clinical end-user expertise. These individuals are highly knowledgeable about the current business and workflows and represent the end users.
- **Program/project manager**—Provides implementation and methodology expertise.
- **Contracting representative**—Provides contracting, negotiation and process expertise.
- **Financial representative**—Provides budgetary expertise.
- **Organizational change leader**—Provides expertise related to facilitating change within the organization.
- **Governance committee**—Provides oversight but is often not directly involved in the team. The selection team reports to this group. Once implementation begins, this group will remain intact to monitor and ensure the project's success. In some organizations, this group is called a steering committee.

The role of team members is to represent their specific area within the organization. It is very difficult to include everyone who will be affected by the new system on the team. Members should be expected to gather information from their peers to bring back to the team. This process helps to ensure that the right information will be reviewed and included where needed throughout the selection process. All requirements should be reviewed and approved by the team.

Solution Selection Activities

Once the requirements have been approved and the decision to buy has been made, it is time to look for vendors that are able to meet them. It is important to consult with your contracting or legal representative to understand the organizational rules and regulations about contacting vendors prior to a signed contract. Some regulations are in place to avoid giving any one vendor an advantage. The contract representative will be able to guide you through the selection activities. The following elements may be involved in solution selection:

- **RFI**: The request for information provides a format for gathering information about which vendors are able to meet the high-level requirements. The responses are compared with the documented requirements, which may be

modified prior to posting the RFP if it is clear some required items are not available or require more definition.

- **RFP:** The request for proposal provides the official request for vendors to submit how they will meet the requirements, which are more defined and include timelines and budget details.
- **Evaluation of RFP responses:** Responses should be reviewed and scored based on ability to meet required, preferred and optional requirements. This step is accomplished with the entire team doing independent scoring of each response, followed by team discussion and consensus on a final score. This process helps identify which vendors can meet the organizational need and provides the first opportunity to eliminate any vendor that cannot.
- **Comparison to IT strategic plan:** When evaluating the responses, it is important to understand how a vendor's solution or planned implementation will fit with the organization's IT strategic plan. Is the IT roadmap leading in the direction of virtualization, to simplification of technologies, or to a decreased number of vendors? How does the offered solution fit with this roadmap? It might be OK if the solution does not fit, but that fact should be considered during selection.
- **An evaluation of a vendor's interoperability capabilities is another important factor to consider:** To adopt best of breed solutions, it is absolutely critical to have interoperable systems that doesn't add burden to the end user workflow. The systems need to integrate seamlessly with the existing solutions to provide greater insights with data integration and efficient workflows with system-level integration. Interoperability capabilities span a wide spectrum from core data integration, standard based data sharing such as using Fast Healthcare Interoperability Resources (FHIR®) or Health Level Seven (HL7®) Version 2, to optimal application integration using Substitutable Medical Applications, Reusable Technologies (SMART) on FHIR or CDS Hooks standards.
- **Compliance with regulatory requirements:** Pertinent regulations should be part of your requirements and listed as essential. All vendors should be evaluated against any government, regulatory or security requirements.
- **Background checks:** Once the list of possible vendors is decreased, some research should be done. This would include evaluation of their financial stability, market share and customer satisfaction. How long a product has been on the market and how many other customers are using it should be matched to your organization's risk tolerance level. Are you an early adopter who can tolerate some issues with the application if you are able to work with the vendor on new features and functionality? Or, would you prefer a solid, reliable application that the vendor has had time to refine? The outcome of this activity should be included in the scoring of each vendor.
- **Demonstrations:** Requesting a demonstration allows vendors to show how they can meet the request. This provides a visual that is very beneficial, but it is often done with a generic version of the product. This does not reflect how it

can be customized to fit the organization's workflows or processes. Prior to the demonstration, it is suggested that a list of scenarios be provided to the vendors so they will show how their product can meet your needs, rather than highlight only the features that they choose. All vendors should be guided to demonstrate the same scenarios to ensure they can be compared with one other. Whenever possible, the same people should be invited to all scheduled demonstrations. Having each vendor demonstrate how their product fits within the same scenarios and having the same people attending each meeting make it easier to properly compare and score each option prior to final selection. It is important to control the agenda very tightly, making sure all scenarios are covered and, if you choose, allowing vendors to demonstrate additional functionality at the end. Demonstrations should be scheduled closely together, if possible, so the information is fresh when they are scored.

- **Trial period or trial version of the software:** With many cloud-based solutions, it is becoming easier to offer trial versions of the system or the system for a trial period. If available, facilities should take advantage of it to run through the end user scenarios in the system to see its fit for the requirements. This also provides for an ability to identify various roles and responsibilities needed for real implementation and to assist in additional implementation planning activities.
- **Site visits:** Visiting a site that has already worked with a vendor and implemented their solution provides an opportunity to speak with people directly, ask specific questions and see how the solution works within their workflows and processes. This helps to demonstrate how the system can be customized during the implementation to fit defined workflows and processes. Questions to ask during site visits would range from what it is like to work with the vendor, how they respond to requests for support during the implementation or after go-live and how easy it is to customize the application or to integrate it with other systems. The number of site visits is often dependent on the number of vendors remaining at this point in the process. The decision on who should participate often depends on who will be affected by the implementation and the distance to be traveled for the visit. It is optimal if the organization, and not the vendor, chooses what sites to visit, but this is not always an option.
- **Client references:** If a site visit is not possible, a call with the reference site would still provide the ability to ask questions. While the selection team will not be able to actually view the system live, the same questions can be asked. Through use of remote web meeting technologies, it is possible to have a demonstration of how a client is using the system without the travel. This provides the ability to understand the implementation process, so remember to ask about any lessons learned from their experience. Just like a demo, there should be predefined questions to be asked of each reference site. Simple web searches and informal contacts with peers can also provide some good reference information.

- **Selection meetings:** Throughout this process, the team is meeting regularly to continuously evaluate and score the remaining vendors against the new information obtained through the research, demonstrations, site visits and original proposal scores. Through this process, the number of vendors should be decreased to two or three. The team's comments and final evaluations of each of the remaining options are provided to the contracting representative for negotiations.
- **Negotiation:** The contract representative negotiates with the remaining vendors to obtain the best solution for the organization. This would include cost, software, hardware, implementation services, support and maintenance. The selection committee, as well as a legal representative, should carefully review all documents sent to the organization from the vendors because once the papers are signed, they are a binding contract. During the negotiation, there may be multiple requested modifications to the documents that require back and forth communication. This process can take a while since each modification needs to be properly reviewed by the other party before they come back with their modifications and so on. The cost tables should include costs for items such as software licenses, integration, data conversions, training, implementation services, hardware and third-party software licenses.
- **Selection:** Based on the negotiations and the final offer from each of the remaining vendors, the team makes a selection. Each step of this process, along with the justification of the selection, should be documented in case any vendor chooses to contest the award. The final agreements often include items such as payment schedule, vendor and client responsibilities, delivery schedule, system installation and configuration documentation, specific deliverables, standard project plan, penalties for not meeting deadlines, termination process, assignment of licenses and process for upgrades or updates.
- **Budget development:** During the negotiations, the budget is developed based on the costs defined during negotiation and selection. The budget often needs to include costs beyond the system vendor. Other items that might be included in the project budget are contractors to supplement the organization's staff; business change management requirements; hardware not purchased through the software vendor, such as new workstations or printers; costs from other vendors for integration services; training; travel; and standard fixed or variable costs, such as space and staffing. The budget is typically finalized within 30 days after the final contract is awarded.

The formality, steps included, and length of this process can vary greatly. There are various reasons for this beyond the organizational contracting process. The contract size, a time constraint, or the desire to stay with a single vendor might shorten this process. With each step, a document or process that is cut brings some level of risk. The organization needs to balance the risk versus the benefit of shortening the process.

Implementation Process

Now that a system has been selected, it is important to define how it will be implemented. While the phases of an implementation are fairly standard, there are a variety of defined methodologies that differ only in the terminology they use or the number of phases. The basic phases which implementation projects go through include: planning, analysis, design, build, test, train, implementation and closeout. It is important to remember that they all start with gathering information and planning what work is required, along with when and how it will be done. Most projects fail due to lack of planning, poor planning, or not following the plan. If the organization does not have a defined project management strategy, it would be important to take the time to decide what processes will be followed throughout the project. This includes defining the project team's roles, categorizing which tasks need the facility project team vs the vendor implementation team, the project manager's authority, the documentation and deliverables expected throughout the project and the role of the governance or steering committee.

The initial activity is to plan how the project will be accomplished. This includes defining what is within and outside the scope of the project. The project sponsors will approve the scope prior to any other plans being finalized. Also, the risk management plan, the change management plan, the training plan, the testing plan, the issue management plan, the work breakdown structure and the communication plan all need to be prepared. All of these documents make up the project management plan and define the tasks to be scheduled to successfully complete the project. When preparations begin for the activation (go-live), the activation plan is developed and approved.

At the end of the planning phase, after the sponsors approve the project management plan, a kickoff meeting is conducted to communicate the project to all stakeholders. The agenda often includes the following:

- The project scope
- The project management methodology, or how the project will be managed
- The change management process, or how changes are requested, analyzed and approved
- Identified risks and their mitigation strategies
- Introduction of the project team and their roles
- High-level milestones and schedule
- The communication plan

This meeting and conversation then kicks off the remaining work, following the phases as identified in the systems development life cycle (SDLC) and using typical project management processes.

Change Management

Any new system will have an impact on the organization, and some change will need to occur. It is not good enough to just automate a process; the process should be improved through automation. Changes affect everyone from top management to end users. Planning for these changes and evaluating the different options for managing them should begin during the procurement process. It is important to have top-level support, as well as a member of senior leadership on the change management team, to show commitment and provide strong leadership. The team should also include members from all affected areas, so they have a sense of ownership and commitment to the project's success. The team should also identify clinical champions as well as IT champions who can serve as the decision makers and point of contact for various change management and risk-management activities, along with other implementation activities.

The team should define a strategic plan similar to the project plan used for implementing the software. The strategic plan should take into consideration the organizational culture and politics related to how staff handle change. The types of resistance that might occur should be identified, along with the strategy to break down the resistance and move on to acceptance. A clear communication plan will ensure the information is properly disseminated throughout the organization.

Adoption is often affected by users' perceptions of how the system fits with their workflow. Does it provide efficiencies or appear to be extra work? Does the system functionality cause a perceived negative change in processes, or can the system be made to fit within the processes and even improve them? Often, the adoption is based on perceived benefit by the end users. The staff has to be ready for the change, which is why stakeholder involvement in the workflow redesign is critical. Having end users involved in hardware selection, such as workstations on wheels or mobile devices, provides feedback to the project team about the usability of the devices being evaluated. Some additional change management principles and strategies will be discussed in [Chapter 9](#).

Implementation Strategies

There are multiple strategies for implementing a new system. Early in the project, they should be evaluated to determine which one is the right fit for the organization and right for the current system implementation:

- **Big bang**—Going live with all functionality to be implemented in all locations at the same time. If there is a legacy system being replaced, this might be the only option. This strategy requires a considerable amount of coordination to ensure that all areas are ready, with hardware in place, training completed and enough support staff available.

- Phased by location—Going live with all functionality to be implemented in one location at a time. This strategy extends the duration of the activation activity, but provides some benefits. The staff from the areas that are already live can assist with providing support to the ones that follow. Holding a meeting after each phase to discuss lessons learned could provide continuous improvement for later phases.
- Phased by functionality—Going live in all locations with one feature at a time. An example would be to bring the admissions process live first for admission, discharge and transfer and patient demographic information, followed by computerized practitioner order entry (CPOE) and then clinical documentation. This strategy also extends the duration of the activation and allows users to gradually get accustomed to the system before utilizing it fully. As above, meeting after each phase to discuss lessons learned could provide continuous improvement for future phases.
- Pilot—Going live initially with one location as a pilot test, and then following with everyone else in a phased big-bang process. This allows the team to learn from a small group before going live with the entire user community.
- Like for like—Going live with functionality to support the same processes that were in place prior to the project. Extra functionality is often added later through configuration management (discussed later in this chapter) or a later project. This strategy is often used when replacing a legacy system or during an upgrade. It helps to decrease the complexity of the activation and decreases the impact on the end users. There will always be some users who perceive this approach to be useless since they do not see an improvement.

Implementing Solutions

You have taken enough time to properly plan how the system will be implemented. You have selected a project team with the right skills, chosen the right implementation strategy, identified what features will be implemented, and developed an outstanding communication plan. Now all you have to do is follow your plan.

This is when the project team takes the basic vanilla application the vendor provides and customizes it to meet the organization's needs. The vendor should provide training to the project team on how to make these changes. This includes configuring the clinical documentation data entry into notes or flow sheets, as well as the output as reports. Each order that can be placed for a patient, such as medications, diagnostic tests, diets and consults, has to be configured in the system. Other items range from drop-down lists for a patient's religion during admission to how surgery will be scheduled. If there is a legacy system, the data conversion or loading of data also happens during this time.

Even if data is migrated early, some data migration will have to occur during activation to ensure that all data is in the new system when it goes live. Care should also be taken to avoid duplication of data during the migration. Data validation after each migration is an important step that should be combined with an action plan to resolve duplicate records if they occur. Vocabulary mapping process should also be implemented to align with industry standards such as RxNorm®, SNOMED® and LOINC®.

Part of the methodology should include how changes are handled during the project. There will be some requests to change the scope of the project or some requirements during the execution phase. Having a defined process for evaluating each request to determine its impact on the project helps prevent scope creep. The change management plan should identify who can submit changes, how changes are evaluated, what documentation is required and who makes the final decision. A request may be approved, denied, or deferred to a later time. The project sponsors usually make the decision with the project manager facilitating the impact analysis.

Testing activities occur throughout the execution. A test plan, which should have been started during the planning and analysis phases, describes all the different testing activities to be completed during the project. Often, the first testing activity is verifying that the hardware and application were installed correctly. Each of the initial environments, such as development, testing, or training, is required to ensure that the installations were successful. Testing will occur throughout the project based on the test plan and the different types of testing to be performed. For additional information on systems testing, refer to [Chapter 7](#).

System Integration to Support Business Requirements

It is rare in healthcare today to have a stand-alone system that does not share data with another in some way. The electronic health record (EHR) should include data from the lab and radiology systems so those who need to make medical decisions can view the results. Patient demographic information should be shared between the outpatient clinic, or office system, and the inpatient EHR so the patient does not need to provide the same information over and over again. Integration allows data to be in multiple systems without manual data entry. Some types of integration to be considered include the following:

- Real-time data integration—Sharing of data nearly simultaneously when it is entered or modified or when another defined trigger occurs. The standard for this type of integration is HL7, which defines the specifics surrounding the interface messages so what is sent from the source system is acceptable by the destination system.

- Scheduled data integration—Sharing of data in a batch according to a predetermined time frame, such as nightly at midnight or every so many hours. The data feed can be accomplished through formatted files or HL7 messages.
- Integration of data from devices—Feeding of data from a specific device into an application. These devices can range from hemodynamic monitors to vital sign monitors and anesthesia machines to ventilators. This type of interface helps decrease manual data entry, but may require the data to be verified before it becomes official within the system.

Integration utilizes an interface engine that receives information from the source system and either passes it directly to the destination system or makes some modification to the data before passing it along. For example, a modification would occur if the source system sent a patient's name as first name and last name, but the destination system could only accept a full name. The interface engine would accept the first and last names, combine them and send the full name on. Different systems have different requirements for how the data is structured and where in the interface message they expect the specific data to be located. The interface message has sections, and a mapping document describes where each piece of data is expected to be and if the interface engine needs to do any manipulation.

User and Operational Manuals and Training

As a project nears activation, it is necessary to educate the end users through documentation and training. If hands-on training is required, a training environment should be set up early in the project to allow the training team to develop materials and hypothetical patient data for any practice exercises that might be included. Training activities are tricky to schedule because they need to take place on the system that will actually be in use. As a result, the training environment cannot be fully set up until the entire configuration is completed and a copy created.

There are many factors that lead to the decision on what type of training should be provided. These include the organizational culture, extent of the change, number of users, users' work hours and even the staff's comfort level with computers. Training can be done through computer-based training modules, lectures, demonstrations, hands-on exercises, or a combination of these.

Training should occur right before the activation so the users will retain what they were taught. The timing depends on how many users need to be trained and how long the training classes will be. Experience shows that the best planning will not eliminate the need for just-in-time training. Inevitably, someone will not make it to class or will not remember how to do something. End-user

manuals and quick reference guides along with the presence of support staff during the initial week or two will help fill this gap.

Activation Planning and Immediate Post-Activation Activities

Planning for the system to go-live begins with the decision on implementation strategy discussed earlier in this chapter and continues through the remainder of the project. The organization should work with the vendor to define which activities can be completed in advance and which have to occur on the go-live day. The actual activities will depend on the specific project. If the organization is moving from a manual process to an automated one or is implementing a new system, the activation could be as simple as having users start using the system. When migrating from a legacy system or upgrading an existing system, the activation activities are more complex and include a period of time when the system is down, or unavailable. A detailed checklist of tasks that occur before and during the activation, whether downtime is scheduled or not, helps to ensure nothing will be missed or forgotten. A rehearsal of the activation provides an opportunity to test the process and fix any mistakes that occur. Evaluating the rehearsal helps to refine the process and the checklist to make the actual activation go more smoothly. It also boosts the project team's level of confidence because they have already done the tasks at least once, depending on how many rehearsals are conducted.

The planning for activation goes beyond the actual tasks that will occur to bring the system up. Other considerations should include where everyone will sit; if a command center will be set up so the entire team will be in one location; if food and drink will be available, especially if the activity will go beyond a few hours; if there will be a place for the staff to rest; what forms of communication will be available for anyone not in the command center; and how status updates will be communicated to the end users. How will issues requiring escalation be handled, and will the vendor be on-site or on the phone to provide assistance?

The type and duration of post activation support will depend on the impact of the change and the amount of just-in-time training expected. When implementing a new system in a clinic, the support staff might be available just before and during clinic hours for the first week. When implementing a new EHR in an acute setting, the support staff might be available around the clock for the first few weeks.

The users will almost immediately have suggestions for changing the system. Having a clear process for submitting requests for change will help users know their input is valuable. With that said, it is important not to make changes too early. Often, the suggestions are just because the system, workflows, or processes are new and different from the ways the users have always done things. Unless suggestions are critical to patient care, they should just be documented for now.

Critical issues should be taken care of right away, but should still follow a defined change management process as discussed previously. The rest of the suggested changes should be evaluated one to two months after activation to see if they are still needed.

Managing Healthcare Information Systems

Once the system is live, it moves into operations and maintenance mode. During this time, the IT department must ensure that it continues to support the mission and goals of the organization and remains reliable and stable. During the implementation project, various processes should be put into place in preparation for this phase. These processes include configuration management, release management, customer support through a service desk and resolution of any issues entered as trouble tickets. Documentation about how the system was configured feeds into good operations and maintenance documentation for resolving issues when they arise. Examples of operations and maintenance documentation include the following:

- **Communication plan**—Defines how end users communicate with the IT department about the new system. How will they request help for an issue? How will they request modifications to the system? How will they request help for general questions about how to use the system?
- **Service desk knowledge base**—Explains how to identify and resolve issues when a user contacts the service desk. This includes questions to ask and decision trees to help identify the resolution or the escalation process if an issue cannot be resolved. The escalation process should include how to approach the vendor if an issue cannot be resolved internally, as well as who has the authority to contact the vendor.
- **Data flow documents**—Identifies where and how data flows from one system to another or from one location in the system to another, along with the dependencies between systems. This includes the triggers that prompt the data to flow, such as a change in the patient's location would trigger the information to be sent to update the lab system.
- **Workflow documents**—Explains end users' workflows and how the system fits into users' daily activities.
- **Configuration management process**—Defines how changes are made and what levels of approval and documentation are required for each change.
- **Downtime procedures**—Identifies which procedures end users will follow when the system is unavailable and what procedures the technical staff will follow to identify and resolve an issue causing downtime.
- **Manuals**—A group of documents ranging from end-user manuals to training guides and the configuration manual that provides step-by-step directions on how to make changes in the system.

Configuration management and release management are processes to control changes to the system, including software and hardware. They involve how changes are requested, the process for review and approval of changes, how changes are made and tested and the process for releasing changes to the different environments to ensure that they are kept in sync and that each migration is verified. It is important that changes are made in a development environment, tested in a test environment and finally verified in production. Conducting regression testing after the changes are made ensures the new modifications did not break something else. Controlling how and when changes are made in each environment is critical in avoiding unexpected negative results.

Working with the vendor on scheduling updates for small fixes, sometimes called hot fixes, to major upgrade releases will keep the system current while minimizing unexpected downtimes. Each new update should be evaluated prior to moving it through the configuration management process. If the update is large enough, it should be managed as a separate project.

Customer support is often provided through a help desk or a single phone number that goes to someone who can listen and help to resolve the issues the end users have. The calls may pertain to an issue with the system; a problem with the usability of the system; or a training or how-to question. Having a good knowledge base that allows the help desk staff to ask the right questions and provides enough information to resolve the issue during the first call can keep customer satisfaction high. For times when the service desk cannot resolve an issue, it is important to have a process for providing second-tier support. Often, this is done through a help desk or ticket management system, but a custom database with workflows and notifications could work also. Timely feedback to the customer is important until the problem is resolved.

Analyzing Data for Problems and Trends

Throughout the life cycle of any application, it is good practice to look for trends in usage as well as problems. Within the first year after an application goes live, analysis should occur to see if it actually met the need that was identified prior to its purchase. This is an evaluation of how well the goals leading to the investment were met and if the expected return on investment was realized. The results should be brought back to the governance committee for possible action, especially if the need was not met.

There are many reasons to collect data and look for trends. A researcher may want to look for levels of new system adoption over the months or years, evaluate user satisfaction with a system, or understand trends in system performance. The ways to collect data can be through surveys, user groups, or visits to the users. On the technical side, looking for trends in error reports, help desk logs, monitor logs, or unexpected downtimes will help the technical staff plan for improvements in system performance.

Ensuring Critical Functions Are Repaired, Maintained or Enhanced

The technical staff receives many different kinds of requests for change. These include feedback from users through help desk calls, rounds, user groups and direct change requests. Some of these requests raise issues that must be fixed by the vendor or seek enhanced functionality not currently available. Vendors often provide updates, as mentioned earlier. Each change, or group of changes, should be evaluated and, if approved, prioritized. The smaller changes move through the configuration management process and are assigned and migrated according to the release management schedule. Larger requests or groups of requests should be managed as separate projects and follow the project management process.

Business Continuity and Disaster Recovery Plans

As was also discussed in [Chapter 5](#), the criticality of the system within the organization will define the disaster recovery and business continuity plans. The business continuity plan defines how an organization prepares for and maintains the business functions related to the defined system. This includes the operations and maintenance of the system to ensure stability, the process of resolving issues that could or do cause the system to be unavailable, how the business will continue without the system and how to recover from an actual disaster.

The disaster recovery plan focuses on the technical aspects, such as data backup and recovery after the system goes down. Backups of the data are often done nightly and stored off-site on redundant servers or through a cloud-computing provider, typically for an indefinite amount of time. There are also hardware configurations that provide some level of continuity, such as automatic failover between clustered servers. Vendors can provide some options for how their systems can be configured. For critical systems, some organizations have off-site facilities where they can recover the system from backup if needed. Part of the disaster recovery plan, or a separate technical downtime plan, should include the steps to follow when the system goes down from causes other than a disaster. How the issue is identified and resolved, who is involved, and the process for a root cause analysis should all be included in this plan. These processes should be tested on a regular basis and updates should be made as needed.

The downtime plan focuses on business aspects, such as how to continue to operate without the electronic system. It includes procedures for communication, hard-copy forms for documentation and plans for how data will be entered into the system once it becomes available again. Once users become dependent on the system for their work processes, they are reluctant to use manual processes. Regular reviews of the downtime plan and communication before any scheduled downtime will help with adoption, but support staff should be available to provide assistance whenever the downtime plan is required.

Summary

Technological advances such as cloud computing and the complex healthcare processes require a systematic approach to proper selection and implementation of products within the healthcare environment. Evaluation and selection criteria should be established in alignment with the organization's strategic requirements, privacy and security requirements and regulatory requirements. Sometimes, a best of breed solution might be a better option than a single vendor solution. Solid project management principles need to be applied during the implementation of the solution. Successful implementation is key to end user satisfaction and effective utilization of the new system. Not only is the initial implementation critical, but also the continued support and maintenance of the system is very important to keep up with the updates and new workflows.

Bibliography

1. HIMSS (Healthcare Information and Management Systems Society). *HIMSS Dictionary of Health Information and Technology Terms, Acronyms and Organizations*. 5th ed. Chicago: HIMSS, 2019.
2. Schwalbe K. *Information Technology Project Management*. 4th ed. Cambridge, MA: Course Technology, 2006.
3. Houston S, Bove L. *Project Management for Healthcare Informatics*. New York: Springer, 2007.
4. Houston S. *The Project Manager's Guide to Health Information Technology Implementation*. Chicago: Healthcare Information and Management Systems Society, 2011.
5. Green M, Bowie M. *Essentials of Health Information Management Principles and Practices*. 2nd ed. Clifton Park, NY: Delmar Cengage Learning, 2011.
6. Project Management Institute. *The Guide to the Project Management Body of Knowledge*. 4th ed. Newtown Square, PA: Project Management Institute, 2008.
7. Morris P, Pinto J. *The Wiley Guide to Project, Program, and Portfolio Management*. Hoboken, NJ: John Wiley & Sons, 2007.